Chemical & Engineering NEWS

Ferrocenophane exhibits fascinating, at times peculiar, behavior Page 23

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Chlor-alkalies losing former market strength

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Chemical & Engineering NEWS

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Luster dims for chlor-alkali producers

Demand for caustic soda, in short supply for some time, is now softening; soda ash market is losing strength; chlorine is worst of all

Bruce F. Greek, C&EN Houston, and William F. Fallwell, C&EN Washington

The rags and riches makeup a year ago in U.S. chlor-alkalies has changed decidedly. The rich products of 1981—caustic soda (sodium hydroxide) and soda ash (sodium carbonate)—now have become a bit frayed. And the poor end of the business in chlorine is an out-and-out welfare case.

Fundamental long-term questions already on the table about this $5.6 billion per-year business have become even more serious. Adjusting to the no-growth, recessionary world of the early 1980s guarantees a shakeout in chlorine and caustic soda. Plant shutdowns already have started. For soda ash, some letup seems in order for its vigorous investment pace of the past few years.

The only bright spot in the chlor-alkali picture at the moment is a strong drive on process technology to save costs. Some dramatic gains could materialize by the mid-1980s in all three products.

At the moment, optimism in chlor-alkalies has become quite relative. "Good performance" in 1982 and beyond will be much less than in the past. For 1982 to be a "good" year, production need only match 1981. For succeeding years production need go up only 2 to 3% annually. A jump of 5% might mean a banner year, although it was average in the past.

Producers hoped a year ago too that production would hold even. But 1981 production of chlorine and caustic soda was off 6%, and soda ash was flat. The same thing happened in 1980 compared to 1979.

Key Chemicals

Current production is well down from early 1981. It appears to be holding at about December 1981 levels, when chlorine plants ran at a lowly 65% of nameplate capacity. A substantial pickup is expected, however, and will be needed in the second half of 1982 to get production back up to 1981's. Still, some analysts say that signs of a pickup in consumer demand must appear this month and in April for a large chlor-alkali production gain in the second half.

Any pickup will need to be sustained beyond the second half for the chlor-alkali industry to regain its former health. How long that will take depends on future growth rates. More and more, opinion points toward rates close to the low levels expected for constant-dollar gross national product. This means an average of 2% annually, well below the 1970's 5 to 7%. This will be especially so if exports of the two alkalies and of chlorine derivatives slump under pressure from foreign competition.

If such a slow pace develops, three big changes are in store. One will be an end to large plant expansions for several years. In 1981, the last of the large chlorine plant expansions of the past half-decade was completed. This year, the last of similarly large expansions in natural soda ash will be nearly completed.

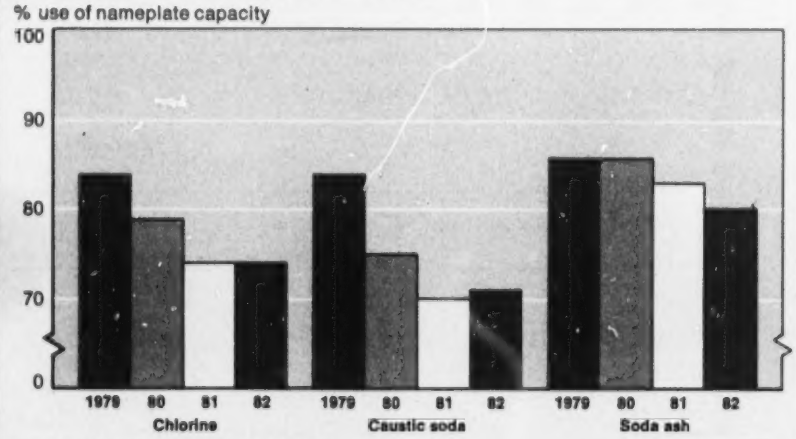
The second major change will be numerous shutdowns of old chlorine-caustic plants. Pennwalt has one in store for mid-1982 at Calvert City, Ky., and more are expected. Chlorine is vulnerable in this regard, since 10% of total capacity is in small plants of less than 275 tons per day.

The third change will be heavy cost-cutting through new technology. For chlorine, new cell technology including the freshly introduced membranes might reduce electric power consumption a third, possibly reaching a long-sought goal of 2000 kWh per metric ton of caustic. Several relatively small plants using new membrane cells have gone into operation around the world, and more are due this year and next. But it will take most of this decade for this technology to have much effect on U.S. production.

For soda ash, new-process solution mining of the trona ore in place of mechanical methods also could reduce costs substantially. Much of the decade might be needed for this change to occur, but the payoff could be big. Solution mining could make U.S. soda ash so much cheaper than foreign synthetic product that no political efforts abroad could block large U.S. exports.

These changes, though important, unfortunately won't help chlor-alkalies very soon. For the sobering details on 1982, see the following pages.

Plant-use levels stay low in 1982



Sources: Chlorine Institute, industry and C&EN estimates

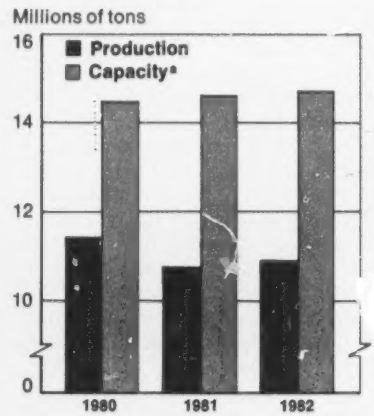
Key Chemicals

Cl_2

Chlorine

- ***Production depressed***
- ***Capacity rise over***
- ***Deep price discounts***

PRODUCTION/CAPACITY



[a] First quarter.

HOW MADE

Electrolysis of NaCl brine; recovery from hydrochloric acid; coproduction with sodium; electrolysis of KCl brine

MAJOR DERIVATIVES (U.S.)

Ethylene dichloride 20%, other chlorinated C_1, C_2 hydrocarbons 10%

MAJOR END USES (U.S.)

Organic chemicals and plastics 70%, pulp and paper 10%

FOREIGN TRADE

Negligible

PRICES

Posted prices $145 per ton Gulf Coast; discounting widespread

COMMERCIAL VALUE

$1.5 billion for production, 1982

Chlorine, the pungent green gas, has become more toxic to its producers than to anyone else. It isn't just the worst off of the U.S. chlor-alkalies; it could well be the financially sickest major product in the chemical industry.

That's a strong statement, but chlorine has qualifications. A combination of miserable markets, overinvestment in plants, and soaring energy costs has left chlorine thoroughly crippled. Rejuvenation could take until the mid-1980s.

Here's a startling statistic. Chlorine's real price hasn't changed a whit since 1977. That means its constant-dollar value for total production has dropped more than half. Formerly the dominant product financially from chlorine-caustic plants, chlorine is now worth only 45% as much as caustic soda.

Chlorine producers hope output from their plants in 1982 will match or slightly exceed 1981 production of about 10.8 million tons. 1981 chlorine production was off about 6% from 1980's 11.5 million tons. And 1980 was down 6% from the record 12.2 million tons in 1979.

After this cascade of production drops, return to the 1979 level could be some time off. Instead of the former 5 to 7% annual growth rates for chlorine production, current thinking calls for 2 to 3%, assuming the economy recovers substantially. Counting 1982 as a no-growth year, it could be 1986 or later before 1979 production again will be equaled—not a happy prospect for a product once known for continued growth.

To no one's surprise, little or no new chlorine plant capacity will be added over the next five years. The last large capacity addition, Convent Chemical's at Convent, La., with 800 tons a day of nameplate capacity, came on stream in 1981. The first-quarter 1982 capacity total is 14.7 million tons per year.

A few smaller additions are in the works, but for practical purposes expansion has stopped. Until existing capacity is again run at historically comfortable levels (above 90%), little incentive likely will exist to add more.

Indeed, there is compelling incentive to reduce capacity by closing plants. Pennwalt is leading the way this year with planned shutdown at Calvert City, Ky. Other closings are expected.

So 1982 and subsequent capacity seems set for a moderate decline. Old, small plants are likely to be shut down as producers with captive (in-house) markets in pulp and paper and other industries find it cheaper to purchase chlorine and caustic outside. Total shutdown capacity now is not expected to exceed 5% of current capacity, perhaps 500,000 tons per year.

Hence, a clutch of shutdowns won't do much for chlorine's operating rate anytime soon. For 1982, plant use might average 74% if demand picks up in the second half. This would be down from 75% in 1981.

Currently, plant operating levels are well below such rates. Plants are running only slightly above the 65% rate of late fourth-quarter 1981.

Chlorine producers are banking heavily on demand recovery in polyvinyl chloride, the largest of hundreds of identifiable chlorine uses. But PVC depends heavily, and unfortunately, on housing. In line with the housing industry, PVC currently is in dismal shape and is not expected to recover even slightly until late spring at the earliest. Because of the time needed to fill the production pipeline from chlorine to the finished plastic, a pickup in this chlorine market will wait at least until summer.

Other uses of chlorine are dominated by organic chemicals, notably industrial and commercial solvents and cleaners which are dependent on industrial production. Since production is off in metalworking and related industries, demand for chlorine for such application has sagged. To a lesser degree, the market for chlorine is down in pulp and paper.

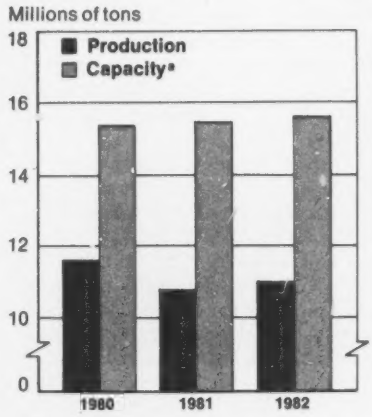
This market rundown makes a dreary recitation, and 1982 for chlorine may be sheer survival time. Chlorine has been through this kind of market wilderness before, in the early 1970s. At that time, too, its price was heavily discounted, and plants were running fairly low. But the operating rate today is far lower, and there is no market boom in sight like the PVC construction pipe bonanza that did so much to pull up chlorine demand in 1973 and 1974. This time around, producers will have to help themselves first, by trimming back old plant capacity and streamlining use of their largest cost item, electricity.

NaOH

Caustic soda

- ***Demand less robust***
- ***Capacity flat***
- ***Prices high, less firm***

PRODUCTION/CAPACITY



a First quarter.

HOW MADE

Electrolysis of NaCl brine

MAJOR END USES

Chemical manufacture 50%, pulp and paper 20%, soap and detergents 5%, petroleum refining 5%

FOREIGN TRADE

Exports—down to about 1.1 million tons in 1982; imports—small, probably under 100,000 tons in 1982

PRICES

Posted at Gulf Coast plants $275 to $285 per ton for 50% liquid grade; higher at other locations and for special grades; recent increase resisted

COMMERCIAL VALUE

$3.3 billion for production, 1982

Caustic soda appears finally to have found a ceiling in its spectacular rise in the past decade. From an unwanted coproduct all but given away, the extremely alkaline material has been transformed into possibly the chemical industry's most wanted major product. It is the only one consistently listed in short supply throughout U.S. manufacturing by the National Association of Purchasing Management.

But all such meteoric rises come to an end. In the past few months, some regional caustic customers have resisted price increases. This would have been unthinkable a year ago and hints a peaking for caustic. Caustic's real price probably had gone up tenfold in the past decade before the recent resistance.

Another hint of softness is that caustic has gone off allocation (new-order restrictions by producers). Although this move has allowed a short-term increase in sales, the general outlook for the year has clouded. Caustic's high price structure could hold down exports and curb further U.S. sales increases. In addition, several major industries that require large amounts of caustic—chemicals, pulp and paper, and oil refining—are suffering low operating rates from the recession.

Caustic soda's high price relates directly to its main long-term problem, sickly coproduct chlorine. The weak chlorine market puts caustic soda in a pinch, driving up the price not just to ration supply but to carry the cost of producing both electrolysis products.

Because almost all chlorine is coproduced with caustic soda, chlorine's market limitations will largely determine 1982 volume for caustic, too. The result is that output of caustic in 1982 will be about 11.0 million tons, up a bit from 10.8 million tons in 1981.

To a limited extent, consumers of caustic could shift to the other large-volume alkali, soda ash. New mine capacity coming on stream to produce natural soda ash this year could mean downward pressure on its price, making it more attractive than caustic to some users such as detergent phosphate and alumina producers.

The size of these potential shifts, fortunately for caustic producers, doesn't seem large. The total probably would be less than 5% of production, most likely closer to 2%, or between 200,000 and 300,000 tons. Most of this potential shift would be in detergent phosphates. Alumina producers are thought to have such high switching costs that their substitutions would be small, especially in light of the depressed state of the downstream aluminum business.

The dominant use of caustic, chemical manufacture, lays caustic open to cyclical ups and downs. Chemical uses are so diverse that their demand for caustic tends to follow the fluctuations of the chemical business cycle. The industry's slump in fourth-quarter 1981 affected caustic, too, although with a delay carrying into the current quarter.

Some growth continues for various caustic markets outside chemicals. For example, caustic used as an acid in petroleum production, especially in enhanced recovery of oil and natural gas, could add 1% a year to caustic's growth rate later on in the 1980s. Other uses, such as in pollution control of wastewater through neutralization, could grow relatively fast, though from a small base. These relatively new uses for caustic will not have much overall effect in 1982, however.

Inventory shifting may not help caustic this year either. Inventories of finished caustic in producers' plants were low during much of 1981 but rose in the fourth quarter. The end of allocation moved some inventory toward caustic-hungry customers, but the amount may be limited because of inventory-depressing high interest costs. For producers, these same high inventory costs plus weak demand for chlorine reduce incentive to run plants harder at a time when energy costs are still rising. In short, the inventory situation reinforces demand weakness in holding down caustic production.

Caustic demand has more influence on operating levels of chlorine-caustic plants than it used to, but chlorine demand is still critical. Getting rid of a chlorine surplus by dumping, as with surplus caustic years ago, isn't practical.

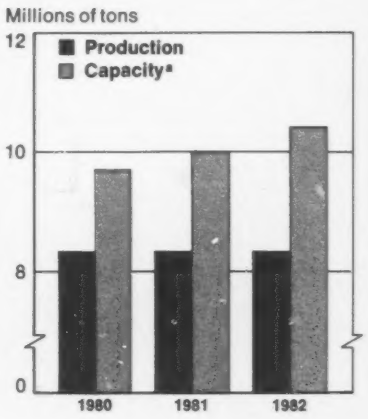
So caustic soda has a double challenge in 1982. Already saddled with chlorine's problems, caustic has a weakening market of its own. Its fast-rising days may be over for a while.

Soda ash

Na_2CO_3

- ***Demand flat***
- ***Capacity rising***
- ***Prices might weaken***

PRODUCTION/CAPACITY



[a] First quarter.

HOW MADE

Recovered from trona ore or brine; synthesized from salt and limestone using ammonia

MAJOR END USES (U.S.)

Glass 55%, chemical manufacture 25%, pulp and paper 5%, soap and detergents 5%

FOREIGN TRADE

Exports—declining in 1982 to under 1 million tons; imports—negligible

PRICES

$92 per ton at Wyoming plants; about $40 per ton higher in eastern U.S.

COMMERCIAL VALUE

$750 million for production, 1982

Soda ash has been a major success story in the past half-decade. An immense investment has paid off to change the industry's base from synthetic plants to trona ore mines in Wyoming.

Although even greater success may lie in store in Wyoming in the mid-1980s, soda ash has had to bow to the recession. It faces a decidedly weaker 1982.

Soda ash has joined the ranks of most other large-volume chemicals in the past year by going into clear oversupply. Its current situation contrasts sharply with its scarcity at the end of the 1970s.

The 1982 outlook for soda ash is an accentuation of trends from 1980 and 1981—a pause in demand while mine capacity rises. The resulting oversupply will be greater.

This year's markets will continue changing the same way they did in 1981. Slight declines in exports will combine with flat traditional markets and a slight gain in neutralizing uses, at the expense of caustic soda, to leave production at about 8.3 million tons.

Such forecasts assume a small improvement in the general U.S. economy in the second half of 1981. This improvement will be needed to offset what appears to be a significantly slower first quarter than in 1981.

The current slowing of production, due partly to severe winter weather, could last somewhat longer. Producers hope to reduce inventories built up in second-half 1981. For example, inventories apparently rose about 100,000 tons in November alone, based on preliminary data, before producers could come to grips with reduced orders.

Later in 1982, inventories are expected to rise again but for a largely technical reason. New capacity is due on stream about midyear at Tenneco's Wyoming plant. Some inventory increase naturally would occur from an expanded production base. Total capacity in the first quarter is 10.4 million tons per year.

The Tenneco plant eventually will have an annual capacity of 1 million tons. Its initial operating rate will be less, probably about half. For 1982 then, the real addition will be 200,000 to 400,000 tons of capacity.

Also reaching production this year will be a new-process solution mine of FMC in Wyoming. Involving a large capital investment, the project is still experimental. Actual output likely would be under the estimated nameplate capacity of 200,000 tons per year.

Success in FMC's solution-mining project could be crucial to the whole soda ash business. Both FMC and other companies looking at solution mining believe that the technique could mean significantly lower costs for soda ash than with conventional mechanical mining or from synthetic soda ash plants. If this potential works out, U.S. soda ash producers could gain in world markets. Most competing non-U.S. soda ash in the world is made synthetically and more expensively from limestone and salt.

However, the outlook for U.S. producers in world markets this year is flat at best. Exports might be down as much as 10% from 1981, when they totaled nearly 1.1 million tons or 13% of U.S. production. At work is a squeeze from slowing world economies, anti-import efforts of European producers, and competition from other nations.

In the U.S., the bright market spot for soda ash continues to be commercial construction. This area includes new glass-walled office buildings. Often big windows in these buildings are double glazed, adding to demand for flat glass, which is second among glass uses of soda ash. Such flat glass use could offset declines in automobile applications and be the best U.S. market for soda ash.

Containers, the largest use of glass and in turn soda ash, got through 1981 with no more than a 1% decline. The outlook for 1982 in this vital area depends on success of competing new plastic bottle machines. Assuming the machines make it, this use might be off 1 to 2% in 1982.

No other among soda ash's many uses will change enough to affect total demand significantly. The result is that producers will have to get through another year of no growth while mine capacity continues upward and prices probably weaken. The main frustration for producers may be the vital export market, which companies have been counting on for sustained growth but which has nothing to offer in 1982.

Canadian chemical earnings plummet in 1981

Although sales increased, Canada's leading chemical companies, caught in a cost-price squeeze, suffered drop in net income of 26%

The only thing good about 1981 as far as the Canadian chemical industry is concerned is that it's over. It was a year that the industry would rather not remember. But it is one that it will have a hard time forgetting.

With raw material costs rising rapidly under the country's controversial national energy program, and with selling prices stymied by a recession, both at home and in those all-important international markets, Canadian chemical companies found themselves caught in a classic cost-price squeeze.

Sales increased last year, but profits took a nosedive. Saving the worst for last, the pinch was particularly severe in the fourth quarter.

The combined results of four of Canada's leading chemical companies (C-I-L Inc., Celanese Canada, Du Pont Canada, and Union Carbide of Canada) tell the story vividly. Combined sales of these four companies increased 11.5% last year over 1980 to $3.5 billion (Canadian). But after-tax net income fell 26% to $144 million.

For these companies, the profit picture became worse as the year droned on. Net income was down only about 7% in the first and second quarters, compared to the comparable periods in 1980. But in the third quarter, the cost-price squeeze started taking its toll when profits dropped a sharp 35%. And in the murderous fourth quarter, they plummeted a disturbing 64%.

One company to escape with an increase in profits last year was C-I-L Inc. Company sales increased 14.5% and net income managed to advance 5.4%. However, even this gain has to be shaved because of the $5.2 million, after-tax, extraordinary expense associated with the company's move into new headquarters in Toronto.

C-I-L chairman and chief executive officer W. J. Mandry could have been speaking for the entire chemical industry when he said that company margins were hurt by rising raw material costs that couldn't be recovered in selling prices. In particular, he cites more expensive natural gas and phosphate rock for fertilizer and ethylene for C-I-L's plastics business.

Despite a 14.5% increase in sales, Du Pont Canada watched its profits slip 21.4% last year. But the company at least had the satisfaction of knowing that sales, which hit $1.1 billion last year, topped the billion-dollar mark for the first time. The company's 1981 earnings look even worse when the company's extraordinary charges are considered. The company took a $70 million extraordinary jolt as a result of withdrawing from the polyester textile filament business.

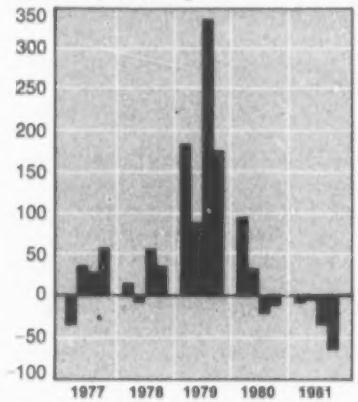
Of the four large Canadian chemical companies, Union Carbide of Canada was hardest hit on the bottom line. Despite a 4% sales increase, net income dropped a resounding 55% last year. The company's polyethylene operations were particularly hard hit. Prices of the polymer remained depressed throughout the year and company chairman John S. Dewar blames it all on an unwelcome combination of a worldwide polyethylene surplus and an abundance of low-priced raw material, particularly on the U.S. Gulf Coast.

If Canadian economic forecasters are right, the chemical industry probably has seen the last of the huge profit squeezes in this recession. Nobody is predicting a significant recovery, at least not until very late in 1982. But the outlook is for some improvement, if for no other reason than it's hard to contemplate things getting worse than they were last year.

Richard M. Clarke, president of Celanese Canada, is one who believes that 1982 will be better than 1981. However, he can look forward to the startup of his company's world-scale methanol plant in Edmonton, Alta., for some help. Most other Canadian chemical majors are reviewing their investment plans and may delay or cut back on some projects that have made Alberta a petrochemical boom area.

Earl Anderson, New York

Combined earnings: bad end to a bad year



a After-tax earnings of four largest publicly reporting Canadian chemical companies—Celanese Canada, C-I-L, Du Pont Canada, and Union Carbide of Canada.

Canadian chemical sales up, but net income drops

$ Millions (Canadian)	FULL-YEAR 1981 Net sales	Change from 1980	Net income	Change from 1980	Profit margin[a] 1981	Profit margin[a] 1980
C-I-L Inc.	$1149.9	14.5%	$ 54.3[b]	5.4%	4.7%	5.1%
Celanese Canada	373.0	11.0	20.3	−7.7	5.4	5.6
Du Pont Canada	1139.1	14.5	33.5[c]	−21.4	2.9	4.3
Union Carbide of Canada	827.3	4.1	36.1	−54.7	4.4	10.0
TOTAL	**$3489.3**	**11.5%**	**$144.2**	**−26.3%**	**4.1%**	**6.1%**

a Net income as percentage of sales. b Before extraordinary expense of moving offices to Toronto. c Does not include extraordinary charge of $70 million reflecting withdrawal from polyester textile filament business.

NOTE

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